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X(3872) and Y(4140) using diquark-antidiquark operators with lattice QCD

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I will discuss recent lattice study of charmonium-like mesons with $J^{PC} = 1^{++}$ and three quark contents $\bar{c}c\bar{d}u$, $\bar{c}c(\bar{u}u + \bar{d}d)$ and $\bar{c}c\bar{s}s$, where the latter two can mix with $\bar{c}c$. In this quantum channel, the long known exotic candidate, X(3872), resides. This simulation employs $N_f = 2$, $m_\pi = 266$ MeV and a large basis of $\bar{c}c$, two-meson and diquark-antidiquark interpolating fields, with diquarks in both anti-triplet and sextet color representations. It aims at the possible signatures of four-quark exotic states. Along the way, I will discuss the relations between the diquark-antidiquark operators and the two-meson operators via the Fierz transformations.

Primary author: Dr MADANAGOPALAN, Padmanath (University of Graz)

Co-authors: Prof. LANG, C. B. (University of Graz); Dr PRELOVSEK, Sasa (University of Ljubljana, Ljubljana; Jozef Stefan Institute, Ljubljana; Jefferson Lab, US)

Presenter: Dr MADANAGOPALAN, Padmanath (University of Graz)

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